ehp Environmental Health PERSPECTIVES
ehponline.org
Published by the National Institute of Environmental Health Sciences

Air Pollution and ST-segment Depression in Elderly Subjects

Diane R. Gold, Augusto A. Litonjua, Antonella Zanobetti, Brent A. Coull, Joel Schwartz, Gail MacCallum, Richard L. Verrier, Bruce D. Nearing, Marina J. Canner, Helen Suh, Peter H. Stone

doi:10.1289/ehp.7737 (available at http://dx.doi.org/)
Online 14 March 2005

The National Institute of Environmental Health Sciences
National Institutes of Health
U.S. Department of Health and Human Services

Air Pollution and ST-segment Depression in Elderly Subjects

Diane R. Gold, M.D., M P.H.

Augusto A. Litonjua, M.D., M.P.H.

Antonella Zanobetti, PhD

Brent A. Coull, PhD

Joel Schwartz, PhD

Gail MacCallum, BS

Richard L. Verrier, PhD

Bruce D. Nearing, PhD

Marina J. Canner, M.A.

Helen Suh, PhD

Peter H. Stone, M.D.

Channing Laboratory (D.R.G., A L., M .C.) and Cardiology Division (G.M., P.H.S.), Brigham and Women's Hospital, Department of Medicine, and Division of Cardiology (R.L.V., B.D.N), Beth Israel Deaconess Medical Center, Department of Medicine, Harvard Medical School, Boston, MA. Environmental Epidemiology Program (D.R.G., A.Z., J.S.) and Environmental Science and Engineering Program (H.S.), Department of Environmental Health; Environmental Statistics Program, Department of Biostatistics (B.C.); Harvard School of Public Health, Boston, MA

Corresponding Author:

Diane R. Gold, M.D., M.P.H.

Address for correspondence:

The Channing Laboratory

Brigham and Women's Hospital

Harvard Medical School

181 Longwood Ave.

Boston, MA 02215

Phone: 617-525-2738

Fax: 617-525-0950

Email: diane.gold@channing.harvard.edu

Total word count: 5477

February 22, 2005

Short running head: Air Pollution and ST-segment Depression

Key Words: air pollution; particles; traffic, cardiology; ST-segment depression, elderly

Supported in part by NIH 5 P01 ES09825, EPA Cooperative Agreement CR821762; EPA 826780-01-0, and EPA R827353-01-0.

Abbreviations

BC=black carbon

CO=carbon monoxide

ECG=electrocardiogram

NO_2=nitrogen dioxide

O_3=ozone

$PM_{2.5}$ =particle mass <2.5 μg/m^3

SO_2=sulfur dioxide

TEOM=Tapered Element Oscillating Microbalance

Outline of Section Headers:

1. Abstract
2. Introduction
3. Methods
    a. Study Design and Protocol
    b. Processing of Holter Recordings
    c. Air Pollution Measurements
    d. Statistical Analyses
4. Results
5. Discussion
6. Conclusion
7. References
8. Tables
9. Figure legend
10. Figure

Abstract

Increased levels of daily ambient particle pollution have been associated with increased risk of cardiovascular morbidity. Black carbon (BC) is a measure of the traffic-related component of particles. We investigated associations between ambient pollution and ST-segment levels in a repeated measures study including 269 observations on 24 61-to-88 year-old active Boston residents each observed up to 12 times from June to September, 1999. The protocol involved continuous Holter ECG monitoring including 5 minutes of rest, 5 minutes of standing, 5 minutes of exercise outdoors, 5 minutes of recovery, and 20 cycles of paced breathing. Pollution-associated ST-depression was estimated for a 10th to 90th percentile change in BC. We calculated the average ST-segment level, referenced to the P-R isoelectric values, for each portion of the protocol. The mean BC level in the previous 12 hours, and the BC level 5 hours prior to testing, predicted ST-segment depression in most portions of the protocol, but the effect was strongest in the post-exercise periods. During post-exercise rest, an elevated BC level was associated with –0.1 mm ST-segment depression ($p=0.02$ for 12-h mean BC; $p=0.001$ for 5-h BC) in continuous models. Elevated black carbon also predicted increased risk of ST-segment depression $\geq$0.5 mm amongst those with at least one episode of that level of ST-segment depression. Carbon monoxide was not a confounder of this association. ST-segment depression, possibly representing myocardial ischemia or inflammation, is associated with increased exposure to particles whose predominant source is traffic.